SENSOR®3

CE Sensor Rack (ESR Series)
ECEM to CEM3 Retrofit Manual

Revision A

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Introduction

This manual is intended to guide ETC Service Technicians through the process of upgrading existing CE Sensor rack installations to Sensor3 racks with a CEM3 control module. This manual covers ESR12, ESR24, ESR36 and ESR48 permanent installation dimming racks.

Contacting ETC Technical Services

If you have questions about the retrofit process that are not answered in this manual, please contact ETC Technical Services.

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Warnings and Notice Conventions

These symbols are used in Sensor documentation to alert you to danger or important information:

Note: *Notes are helpful hints and information that is supplemental to the main text.*

CAUTION: *A Caution statement indicates situations where there may be undefined or unwanted consequences of an action, potential for data loss or an equipment problem.*

WARNING: ***A Warning statement indicates situations where damage may occur, people may be harmed, or there are serious or dangerous consequences of an action.***

WARNING: ***RISK OF ELECTRIC SHOCK! This warning statement indicates situations where there is a risk of electric shock.***

Safety

Please note the following safety warnings before use:

- Disconnect power from the racks before all maintenance.

WARNING: ***Dimmer racks without an accessible power disconnect device cannot be serviced safely. Before removing dimmer or control modules for service, de-energise main feed to dimmer rack and follow the appropriate safety procedures for your region.***

Overview of this Manual

Reference this manual throughout the retrofit procedure. The major sections of the procedure are:

- *Preparation, page 5* - before you open the rack.
- *Remove the Old, page 5* - labeling and remove the existing equipment.
- *Data Terminations, page 7* - adapting and connecting the data terminations.
- *Attach new power harness, page 8* - adapting and connecting the power harness for the new backplane.
- *Install the New Backplane, page 10* - transfer the wiring and install new components.
- *Change out the AF Cards (if present), page 11* - remove the existing Advanced Feature cards and install the new ones.
- *Change out the Beacon PCB, page 12* - replace the beacon pcb with the new one.
- *Verify the Retrofit, page 13* - put the dimmers back in the rack and power up the rack.
- *Configure the CEM3, page 13* - program a configuration for the CEM3.

When viewing this document in electronic form (.pdf file) with Adobe Acrobat Reader, blue italicised text followed by a page number such as "*Overview of this Manual, page 2*" is a link within the document. If you click on the link, it will jump to that section or topic.

Section 1
Unpack and Organise

The table below lists the parts and components needed to retrofit a CE Sensor rack (ESR12, 24, 36 or 48) to become a Sensor3 rack with a CEM3. Each part is listed to reflect the different quantities for the different kits and types of racks.

	Parts/Components ETC Part Number	ESR12 Rack 7144K1000	ER24-48 Rack 7144K1001
Parts Included in the Kits	Beacon Door Acrylic 7051A4116	1	1
	CAT5 Termination Kit 4101A2003	1	1
	Sensor3 Beacon Blue Assembly 7141B5109	1	1
	Sensor3 Install Rack Door Label 7141A4001	1	1
	8-pin Screw Terminal Data Connector J3407-F	2	2
	ECEM Classic to CEM3 Power Adapter Harness, ESR12 7144B7002	1	
	ECEM Classic to CEM3 Power Adapter Harness, ESR24-48 7144B7003		1
	CE Sensor3 Install Rack Backplane Assembly, Sgl Height 7144A2000-CFG	1	
	CE Sensor3 Install Rack Backplane Assembly, Dbl Height 7144A2001-CFG		1
	Sensor+/3 Filler Module 7150A3010		1
	Sensor Rack CEM Classic to CEM3 Retrofit Manual 7144M2310	1	1
	CAT5e Cable RJ45/RJ45 UTP 2ft N4035	1	1
	Screw 6-32 X 3/8 Ph PH MS CP W/Patch HW222	3	3
	Screw M4 X 10mm Ph PH MS W/Patch HWM1346	3	3
	Cable tie 4" Hi-temp Black HW7121	28	28
	CEM3 Backplane 1/8” #8 screw spacer HW9343	3	3
	Tie-mount (sticky-back) HW741	14	14
	Heat Shrink 1-1/2” x 4-1/2” Black W682	2	2

Additional Items		
Additional Line Items	Sensor3 AF Card (for all AF racks) 7150B5623	up to 4*
	CEM3 7140A1001	1

** Need/quantity based on specific rack type. For details contact ETC Technical Services (see Contacting ETC Technical Services, page 1).*

Required Tools
#1 Phillips screwdriver
#2 Phillips screwdriver
6mm flat head screwdriver
PVC Electrical tape
Heat gun
Diagonal wire cutter
Permanent marker
Wire strippers

Section 2
The Retrofit

Preparation

Step 1: Use Sensor Configuration Editor and a SLTA if you wish to download and save the current Sensor configuration out of the racks for later reference. For information on this process contact ETC Technical Services (see page 1).

Step 2: Turn off main power to the rack(s).

Step 3: Remove the eight dimmer modules above the ECEM (if retrofitting an ESR36 or 48 rack, remove the eight modules below the ECEM as well). Note and document the modules' order/positioning in the rack for proper insertion and configuration later.

Step 4: Use a digital voltmeter to **VERIFY that power is off** by checking voltages for all combinations between the phase bars, neutral and earth.

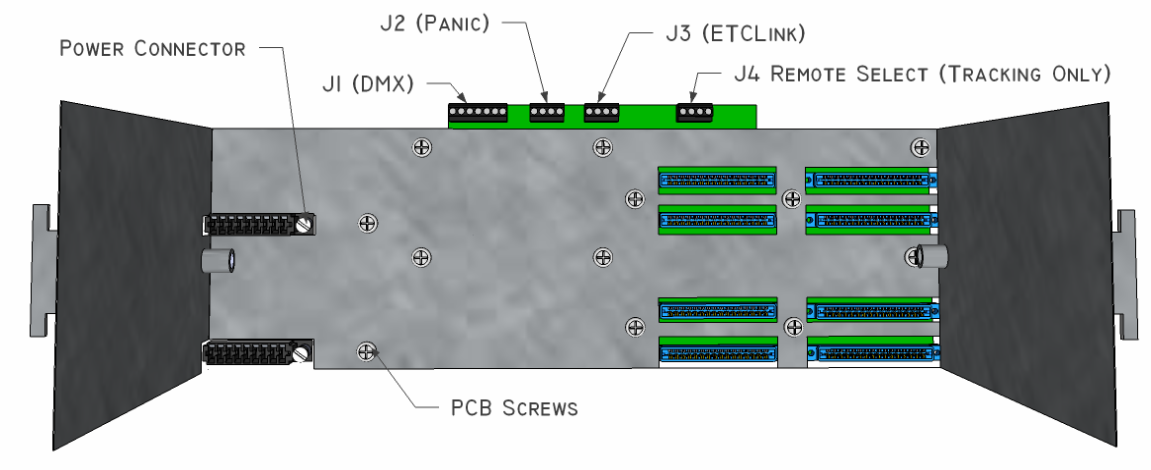
Step 5: Remove the ECEM(s) from the rack.

Remove the Old

Note: *Many of the components you will be removing are valuable dimming components and can be used by ETC to support other systems.*

Please return old ECEM processors, ECEM backplanes, and fan relays to the local ETC office (see page 1 for address).

Step 1: Unscrew the power backplane connector(s) from the old backplane metal



Step 2: Feed the power connectors through the backplane metal so they are loose next to the phase bars.

Step 3: Unscrew the backplane PCB from the backplane metal by undoing the remainder of the screws

Step 4: Unscrew the backplane metal from the rack by undoing the two screws that go

through the standoffs on the side of the backplane into the rack metal

Step 5: Pull backplane towards the front of the rack to free the backplane side tabs

Step 6: Bend the right side of the backplane metal toward the centre (away from the side of the rack)

Step 7: Slide backplane metal forward to remove it from the rack, cut the earth lead to the chassis and discard the wire.

Step 8: Mark the connectors on the grey dimmer output ribbon cables (using permanent marker).

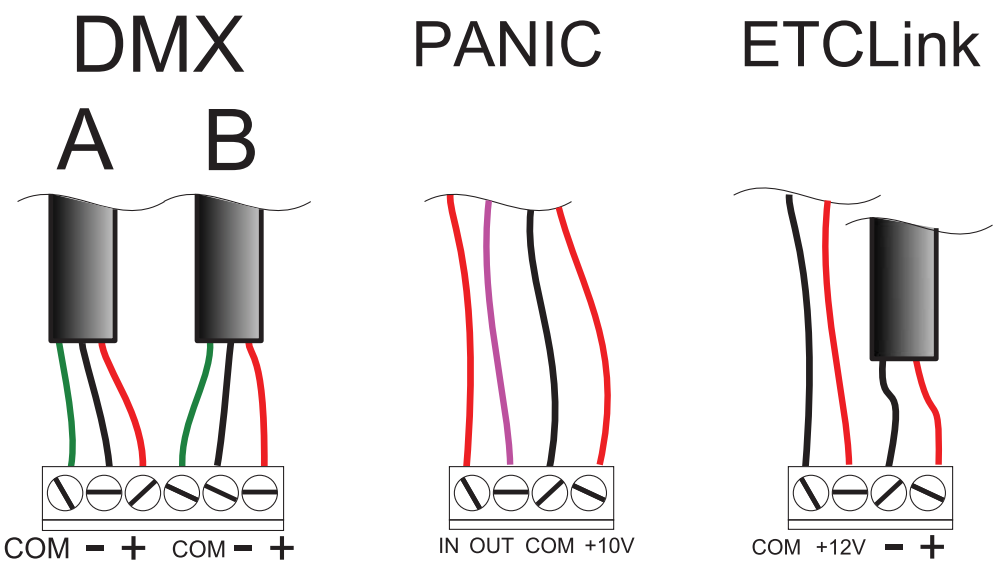
- The connectors are designated 1-24, 25-48, 49-72 and 73-96 (depending on the size of the rack, you may have fewer ribbon cables).
- The connector can be identified by referring to the white printing on the old backplane PCB

Step 9: Once all the ribbon cables are marked, disconnect them.

Step 10: If fitted, remove the ferrite toroids from the cables and discard.

Step 11: Document and remove the input data wires (ETCLink, DMXA, DMXB and Panic).

Note: *Be sure to note and label the wires before disconnecting them from the terminal strips. You will need to connect these wires to the new backplane in the correct order later.*



Step 12: Disconnect the 5 pin beacon & fan relay control connector from the backplane PCB

Step 13: If in a dual tracking system, disconnect the 3 pin local switch connector from the backplane

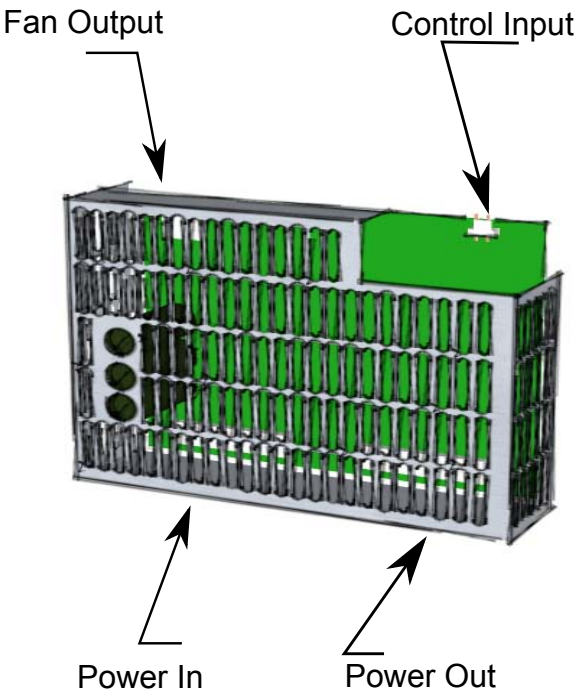
Step 14: Remove the backplane PCB and return the backplane to ETC Technical Services (see page 1).

Step 15: Cut the 5 pin header from the beacon cable, as close as possible to the connector that was connected to the backplane PCB.

Step 16: Locate the fan filter relay board for your rack. The fan filter relay board is located behind the ECEM attached to the back of the rack for ESR24,36 and 48 racks.

- The fan filter relay board is located at the top of the rack in ESR12 racks

Step 17: Disconnect the three Molex power connectors and the small relay control connector from the fan filter relay board.



Note: *The fan filter relay board is not used after upgrade. It can be removed from the rack if desired, or left in place.*

Step 18: By pulling the relay control wires through, you should be able to remove them from the rack. You will be left with three beacon wires at the backplane location.

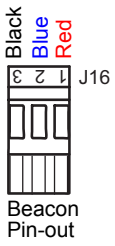
Step 19: Remove the harness that ran from the fan filter relay board to the ECEM power connector, carefully clipping cable ties as required.

Data Terminations

Connect beacon wires

Step 1: Strip 6mm (1/4 inch) of insulation from the end of the remaining red, blue and black wires (the beacon wires)

Step 2: Connect the three wires to the 3 pin phoenix connector supplied in the new backplane, in the order shown at right.



Transfer DMX Wires

When transferring wire groups be sure to transfer all wire groups (except those designated as ETCLink) to the new connectors separately to avoid confusion.

a: In most cases stranded wire has been used for the data terminations. If so, terminate the DMX wiring to the new connectors (found in the kit) in the same manner as they were to the old backplane. Double-up the DMXA pass-thru wiring to the same terminals as the DMXA wires. The DMX pass-thru connector on the CEM3 backplane will not be used.

b: If Category 5 type cabling (or better) has been used for the DMX wire runs, IDC connectors must be used (ordered separately) for the new terminations. Connect the pass-thru wires to an IDC connector and land the rack-to-rack jumper connections on the separate “DMX PASS-THRU” connector (J12) on the new backplane. DMXA PASS-THRU = Common - 1, Negative - 2, Positive - 3. DMXB PASS-THRU = Common - 4, Negative - 5, Positive - 6.

CAUTION: If using the IDC connector for CAT5 solid-core wiring, you must start with clean wire ends (clip the old punched end). Re-punching the old ends could result in an intermittent or failed connection.

Step 3: Connect the DMXA wires to an 8-pin connector. DMXA wires connect to the following terminals: Gray wire (Common)- 1, Black (DMX Negative) - 2, Red (DMX Positive)- 3.

Step 4: Connect the DMXB wires to another 8-pin connector. DMXB wires connect to the following terminals: Clear wire (Common) - 1, Black (DMX negative) - 2, White (DMX Positive) - 3.

Cap ETCLink Wires (if present)

Step 5: Locate the ETCLink wires you removed from the backplane

Step 6: Secure wires as follows:

a: Cut all bare ends from the link wires.

b: Safely cap the wire ends.

c: Coil the wires into a neat bundle and secure with a wire tie.

d: Secure the cabling to the side or back of the rack with tie mounts and wire ties so they do not interfere with normal rack function.

Note: *Wire runs for ETCLink are abandoned in the rack and can be used in the future as DMX wire runs in the event that a DMX line must be replaced for any reason.*

Attach new power harness

Step 1: Connect the transition power harness to the two molex connectors that were disconnected from the fan filter relay board

Step 2: Run the transition harness into position at the left hand side of the rack for connection to the new backplane.

- For ESR36 and 48 racks, it runs behind the L2 Phase bar
- For ESR24 and 12 racks it runs into the open space behind the backplane

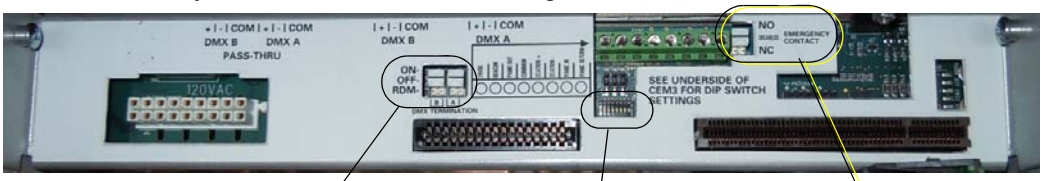
Step 3: Run the earth wire to the earth bar of the rack and secure it using the small screw on the bar.

- Due to different rack sizes, there may be extra earth cable left. If so, bunch it neatly and cable tie it into the back of the rack.

Step 4: Secure the transition harness using the provided 4” cable ties and sticky bases.

Backplane Settings

Upgrade kit backplanes ship from the factory with all DIP switches in the off (down) position. You will have to set the DIP switches on the new backplane to match your rack. You will also have to verify the termination switch settings.



Set termination to "Off" (middle position)

Set DIP switches

Emergency Contact (Panic) switch

a: Set both termination switches to "Off" (middle position) for all racks except the last rack in your system.

b: Set the termination switches for the *last* rack in the system to "ON" (top position).

c: Using a precision screwdriver, set the DIP switches to match your rack type according to:

- number of modules (12, 24, 36 or 48)
- whether the rack has Advanced Features (AF)

Use the following chart to determine your required DIP switch settings:

	DIP switch Number							
Rack Model	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
ESR3-12				On			On	
ESR3-12N				On	On		On	
ESR3-12AF		On		On			On	
ESR3-12AFN		On		On	On		On	
ESR3-24				On				On
ESR3-24N				On	On			On
ESR3-24AF		On		On				On
ESR3-24AFN		On		On	On			On
ESR3-36				On		On		
ESR3-36N				On	On	On		
ESR3-36AF		On		On		On		
ESR3-36AFN		On		On	On	On		
ESR3-48				On				
ESR3-48N				On	On			
ESR3-48AF		On		On				
ESR3-48 AFN		On		On	On			

"On" position = switch pushed to the top

d: Check to see that the "Emergency Contact" switch is set to the appropriate position.

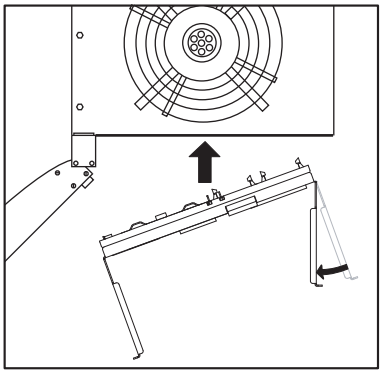
- If your system has no panic circuit, the switch should be set to the middle position, "DISABLED".
- If your panic circuit includes a Normally Open contact closure, the switch should be set to the top position (NO).
- If your panic circuit includes a Normally Closed contact closure, the switch should be set to the bottom position (NC).

Terminating the ethernet cable inside the rack

Since you will be adding ethernet capability to your ESR rack, ETC has provided the CAT5 Termination Kit (ETC Part#4101A2003). This kit includes a CAT5 connector and a small surface mount box (called a “Biscuit Box”) as well as an instruction sheet.

Follow the instructions in this kit for terminating the ethernet cable at the CAT5 connector and enclosing the connector in the biscuit box. The biscuit box will then be mounted inside of the ESR rack in the next section.

Install the New Backplane



Step 1: Bend one arm of the new backplane metal in towards the opposite arm (about 30 deg).

Step 2: Insert the backplane metal on an angle. Then straighten it once it is past the face of the rack. Push it into the rack far enough that it stays in place, but leave yourself some room to make the power and data connections.

Step 3: Make the power and data connections on the backplane.

a: Install the dimmer output ribbon cables. Open the black retaining tabs for each connector until they are at a 45° angle to the backplane. Press the ribbon cables into their respective locations until the tabs lock in place at a 90° angle to the backplane.
Note: The order/layout for the cables is not the same as on the old backplane (see illustration below). **Make sure the proper side is facing up on each connector and that each connector is fully seated.**

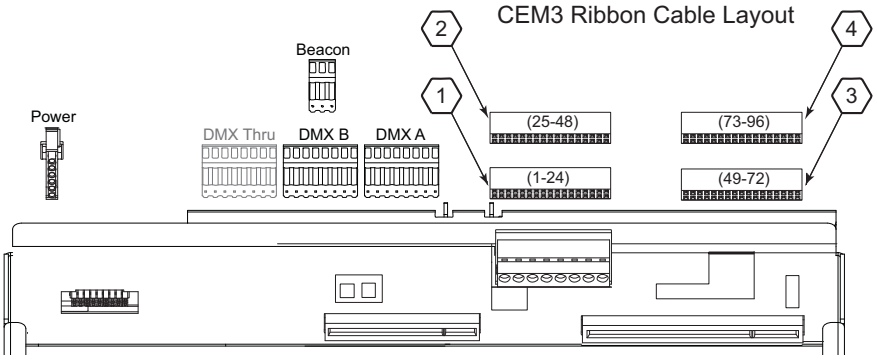
b: Install the power harness (Look at the pin shapes for proper orientation. It will only fit one way.)

c: Install the DMX connections. (The wires travel out of the top on both styles of connectors.)

d: Install the 3-pin beacon connector (The wires travel out of the top of the connector)

e: Connect the CAT5 biscuit box to the ethernet connector on the backplane using the 1' CAT5 Ethernet cable. (Not shown in the drawing below for clarity.)

- **In an ESR12 or ESR24**, use the double-stick tape (on the box) to secure the biscuit box to the bottom of the rack behind the backplane.
- **In an ESR36 or ESR48**, use the double-stick tape (on the box) to secure the biscuit box to the interior rear wall of the rack, behind the backplane.

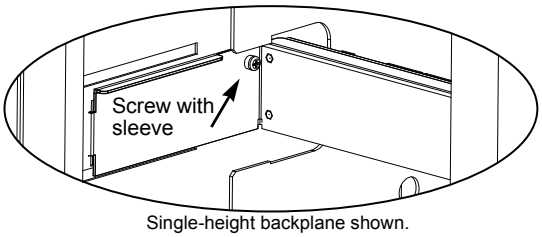


Step 4: Push the backplane completely into place in the rack. Be careful not to disrupt the power and data connections you just made. Make sure none of the wiring

becomes stressed or pinched.

Step 5: Insert the backplane tabs in the sides of the rack.

Step 6: With the tabs fully inserted in the sides of the rack, pull the backplane towards the front of the rack to line up the screw holes in the upper side corners to line up.



Single-height backplane shown.

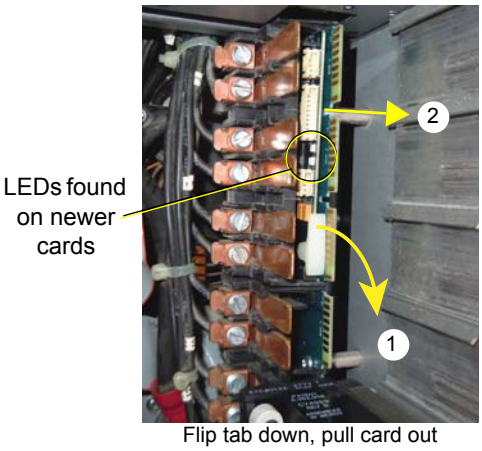
Step 7: Install one screw with a sleeve in the upper-corner (for single-height backplanes) or the middle of the rear edge (for dual-height backplanes) of each side of the backplane.

Note: *You cannot use the old screws without the additional shoulder-sleeve as they will block the CEM3 from being fully inserted.*

Change out the AF Cards (if present)

If your rack supports Advanced Features (AF) you will need to replace the AF cards as well. CEM3 only supports use of the newer-style AF cards, which have eight address switches and two LEDs (shown at right).

AF cards are located on the right side of the dimmer module slot between the copper neutral busses and the dimming circuitry cards.



Flip tab down, pull card out

To replace the AF cards:

Step 1: Remove the old AF cards by flipping the white retainer tab on the cards into the down position.

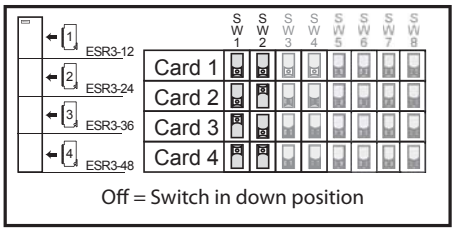
Step 2: Pull the old cards out of the slots.

Step 3: Set the DIP switches on the new cards according to the chart below. Only the first two DIP switches are used.

Step 4: Slide the new AF cards completely into the vacant slots starting with card #1 in the top. The number of cards depends on rack size.

Step 5: Flip the white tab up to lock the new card in place.

AF Card Addressing



Change out the Beacon PCB

Step 1: Remove the top four dimmer modules from the rack to allow access to the PCB.

Step 2: Remove the two screws that hold the beacon PCB in the face of the rack.

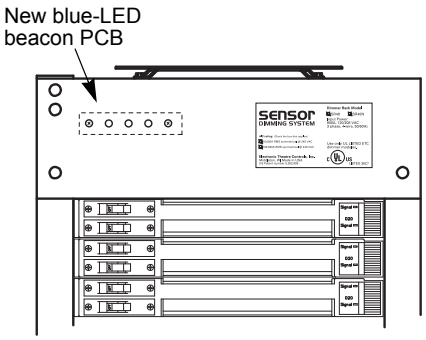
Note: *Be sure to use a properly sized screw driver (#2 Phillips) and a good amount of force as these screws are kept in place with thread locker. Don't worry about damaging the existing screws (replacements are provided) or shearing off the heads of the screws (the screw shanks are threaded into the PCB's standoffs).*

Step 3: Pull the PCB down from inside the rack case. (The wire harness will only allow a few inches of movement).

Step 4: Note the orientation of the connector and unplug the wire harness from the old beacon PCB.

Step 5: Attach the wire harness to the new beacon PCB making sure the connector is in the same orientation as before.

Step 6: Install the new beacon PCB (ETC Part # 7141B5109) with two screws (ETC Part # HW222) (two new screws of the same type are provided in case the old ones were damaged during the removal process).



Finishing Touches

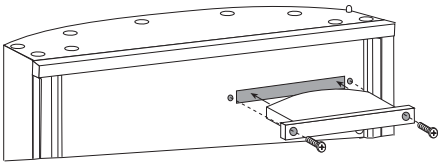
Step 1: Remove the old Sensor beacon acrylic in the door by loosening the two retaining screws with a #2 Phillips screwdriver. You may discard the beacon acrylic.

Step 2: Install the Sensor3 beacon acrylic in the door.

Step 3: Carefully peel the old Sensor label from the front of the door and discard.

Step 4: Clean the door surface to remove any dirt or old adhesive and wait until it is clean and dry

Step 5: Apply the new Sensor3 label to the front of the door. Line up the label around the opening for the acrylic in the door and be sure the label is straight. Press and wipe with a piece of cloth or paper towel to make sure the label is flat & smooth and properly adhered to the rack door.



Repeat the above steps for the remainder of connected racks.

Note: *Please return old ECEM processors, ECEM backplanes, and fan relays to the local ETC office (see page 1 for address).*

Verify the Retrofit

Step 1: Put the dimmer modules back in the rack in the correct/original order.

Step 2: Put the CEM3 in the rack.

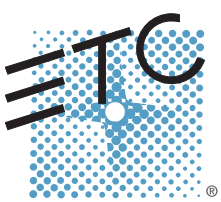
Step 3: Power up the rack.

Step 4: Check that the CEM3 powers up and the rack fan turns on. (The only rack errors should be a lack of DMX on the ports if the DMX source is not present.)

Configure the CEM3

Step 1: Configure the rack to reflect the dimmer module types installed. Verify that the rack type is correct (CEM3 should have determined this from the DIP switch settings - see *Backplane Settings, page 9*). Configuration of the CEM3 is done using the front face panel interface. See the *CEM3 Quick Guide* that ships with the CEM3 for more information.

Step 2: Configure the data types that will be used (DMX and sACN) including the rack patch.



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